

What is claimed is:

1. A tandem axle system, comprising:
    - a first axle (12) having a first brake actuating chamber (26, 50, 122, 148) with a first diaphragm (34, 58, 126, 150), said first diaphragm (34, 58, 126, 150) connected to a first brake actuating arm (46, 70, 132, 156) for engaging a first friction device (13) on said first axle (12);
      - a second axle (14) having a second brake actuating chamber (28, 52, 134, 160) with a second diaphragm (42, 66, 138, 162), said second diaphragm (42, 66, 138, 162) having a smaller area (44, 68, 140, 164) than an area (36, 60, 128, 152) of said first diaphragm (34, 58, 126, 150), said second diaphragm (42, 66, 138, 162) connected to a second brake actuating arm (48, 72, 144, 168) for engaging a second friction device (15) on said second axle (14); and
        - at least one control valve (24) in fluid communication with both said first and said second diaphragms (34, 42, 58, 66, 126, 138, 150, 162) to displace said first and second brake actuating arms (46, 48, 70, 72, 132, 144, 156, 158) and engage said first and second friction devices (13, 15) on said first and said second axles (12, 14), respectively.
- 20 2. The apparatus of claim 1, wherein a displacement of said second brake actuating arm (48, 72, 144, 168) by said second diaphragm (42, 66, 138, 162) is less than a displacement of said first brake actuating arm (46, 70, 132, 156) by said first diaphragm (34, 58, 126, 150).
  - 25 3. The apparatus of claim 1, wherein said first and said second brake actuating arms (46, 48, 70, 72) have a substantially equal length.
  4. The apparatus of claim 1, wherein said second brake actuating arm (48, 72, 144, 168) is shorter than said first brake actuating arm (46, 70, 132, 156).
  - 30 5. The apparatus of claim 1, wherein said at least one control valve (24) provides less fluid pressure to said second brake actuating chamber (28, 52, 134, 160) than said first brake actuating chamber (26, 50, 122, 148).

6. The apparatus of claim 1, wherein a second control valve (170) is in fluid communication with said second brake actuating chamber (28, 52, 134, 160), wherein said second control valve (170) provides less fluid pressure to said second brake actuating chamber (28, 52, 134, 160) than fluid pressure provided to said first brake actuating chamber (26, 50, 122, 148).
- 5
7. A tandem axle system, comprising:
- a first axle (12) having a first brake actuating chamber (74, 98, 122, 146) having a first diaphragm (78, 102, 126), said first diaphragm (78, 102, 126) connected to a first brake actuating arm (94, 118, 132) for engaging a first friction device (13) on said first axle (12);
- 10 a second axle (14) having a second brake actuating chamber (76, 100, 134) having a second diaphragm (80, 104, 140), said second diaphragm (80, 104, 140) connected to a second brake actuating arm (96, 120, 144), said second brake actuating arm (96, 120, 144) shorter than said first brake actuating arm (94, 118, 132), for engaging a second friction device (15) on said second axle (14); and
- 15 at least one air control valve (24) in communication with both said first and said second diaphragms (78, 80, 102, 104, 126, 138) for individually engaging said first and said second diaphragms (78, 80, 102, 104, 126, 138) to displace said first and second brake actuating arms (94, 96, 118, 120, 132, 144) and engage said first and second friction devices (13, 15) on said first and said second axles (12, 14), respectively.
- 20
- 25 8. The apparatus of claim 7, wherein said second diaphragm (80, 104, 138) has a smaller area (84, 108, 140) than an area (82, 106, 128) of said first diaphragm (78, 102, 126).
- 30 9. The apparatus of claim 7, wherein a displacement of said second brake actuating arm (96, 120, 144) by said second diaphragm (80, 104, 138) is less than a displacement of said first brake actuating arm (94, 118, 132) by said first diaphragm (78, 102, 126).

10. The apparatus of claim 7, wherein said at least one air control valve (24) provides less fluid pressure to said second brake actuating chamber (76, 100, 134) than said first brake actuating chamber (74, 98, 122).
- 5        11. The apparatus of claim 7, wherein a second air control valve (170) is in fluid communication with said second brake actuating chamber (76, 100, 134), said second air control valve (170) provides less fluid pressure to said second brake actuating chamber (76, 100, 134) than fluid pressure provided to said first brake actuating chamber (74, 98, 122).
- 10      12. A method of braking a tandem axle system, comprising:  
                engaging a first friction device (13) on a first axle (12) with a first brake actuating arm (46, 70, 94, 118, 132, 156) connected to a first diaphragm (34, 58, 78, 102, 126, 150);  
                engaging a second friction device (15) on a second axle (14) with a second brake actuating arm (48, 72, 96, 120, 144, 168) connected to a second diaphragm (42, 66, 80, 104, 138, 162); and  
                providing a pre-determined amount of pressurized fluid to said first diaphragm (34, 58, 78, 102, 126, 150) and said second diaphragm (42, 66, 80, 104, 138, 162) to engage said first friction device (13) and said second friction device (15).
- 15      13. The method of claim 12, wherein said second brake actuating arm (96, 120, 144, 168) is shorter than said first brake actuating arm (94, 118, 132, 156).
- 20      14. The method of claim 12, wherein said second brake actuating arm (48, 72, 96, 120, 144, 168) provides a braking force to said second friction device (15) less than a braking force said first brake actuating arm (46, 70, 94, 118, 132, 156) provides to said first friction device (13).
- 25      30

15. The method of claim 12, wherein said second diaphragm (42, 66, 138, 162) has a smaller area (44, 68, 140, 164) than an area (36, 60, 128, 152) of said first diaphragm (34, 58, 126, 150).

5       16. The method of claim 12, wherein said second diaphragm (42, 66, 80, 104, 138, 162) displaces said second brake actuating arm (48, 72, 96, 120, 144, 168) a shorter distance than said first diaphragm (34, 58, 78, 102, 126, 150) displaces said first brake actuating arm (46, 70, 94, 118, 132, 156).

10      17. The method of claim 12, wherein a control valve (24) provides less fluid pressure to said second brake actuating chamber (28, 52, 76, 100, 134, 158) than said first brake actuating chamber (26, 50, 74, 78, 122, 146).

15      18. The method of claim 12, wherein a first control valve (24) provides an equal fluid pressure to said second brake actuating chamber (28, 52, 76, 100, 134, 158) and to said first brake actuating chamber (26, 50, 74, 98, 122, 146).

20      19. The method of claim 18, wherein a second control valve (170) in fluid communication with said second brake actuating chamber (28, 52, 76, 100, 134, 158) communicates a fluid pressure to said second brake actuating chamber (28, 52, 76, 100, 134, 158) less than a fluid pressure communicated to said first brake actuating chamber (26, 50, 74, 98, 122, 146).